Atty. Docket No. CA1457
PATENT APPLICATION

AMENDMENT UNDER 37 C.F.R. § 1.111
U.S. Application No.: 09/783,163

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the

application:

LISTING OF CLAIMS:

1.   (*Currently Amended*) A storage management service system, comprising:

a storage on demand (SoD) center system;

a storage subsystem including a plurality of storage devices, a plurality of I/O ports, a

device management table storing information on usability of the storage devices, an I/O port

management table storing information on available connections between the I/O ports and the

storage devices, and a SoD resource management processor capable of communicating with the

SoD center system and of modifying the device management table and the I/O port management

table; and

a host computer coupled to said storage subsystem and to said SoD center system, said

host computer including a plurality of host I/O controllers, an I/O path setting table defining

available connections between the host I/O controllers and the I/O ports, an operating system

capable of modifying the I/O path setting table, and an SoD agent capable of communicating

with the SoD center system and of communicating with the operating system to request

modification of the I/O path setting table; wherein

said SoD center system is remote from the host computer and the storage subsystem;

each of said host I/O controllers is coupled via a different communication channel to a

respective one of said I/O ports; [[and]]

2

AMENDMENT UNDER 37 C.F.R. § 1.111
U.S. Application No.: 09/783,163

said SoD center system receives input of an SoD demand, and, thereafter, sends

information to said SoD resource management processor on said storage subsystem to manage

the device management table and the I/O port management table and thereby manage the

usability of the storage devices and the available connections between the I/O ports and the

storage devices, and ~~if necessary~~ sends information to the SoD agent on the host computer to

request the operating system to manage the host I/O path setting table and thereby manage

available connections between the host I/O controllers and the I/O ports; and

said storage subsystem: receives an I/O command to access storage resources from said

host computer: determines whether storage resources requested by said I/O command are usable

by searching said device management table; performs said I/O command, if said storage

resources requested by said I/O command are usable, otherwise rejects said I/O command; and

sends an I/O result to said host computer.

2.   (*Previously Presented*) The system of claim 1, wherein said host computer sends

a setting result to said SoD center system.

3.   (*Previously Presented*) The system of claim 1, wherein said host computer and

said storage subsystem are coupled by physical and logical connections between at least one of

the host I/O controllers and at least one of the subsystem I/O ports.

4.   (*Previously Presented*) The system of claim 1, wherein said host I/O controllers

and said I/O ports are coupled by a network switch.

3

AMENDMENT UNDER 37 C.F.R. § 1.111
U.S. Application No.: 09/783,163

5.   (*Original*) The system of claim 4, wherein said network switch comprises a fibre

channel network switch.

6.   (*Currently Amended*) A storage apparatus comprising:

a plurality of storage devices;

a plurality of I/O ports providing an interface to said plurality of storage devices, each I/O

port being uniquely connectable to one of a plurality of host I/O controllers on a user machine;

a device management store, in which a status of said plurality of storage devices is stored,

and an I/O port management store, in which available connections between said plurality of I/O

ports and said plurality of storage devices are stored; and

a storage resource management processor connectable via a network to an SoD center

system, the storage resource management processor being capable of communicating with a SoD

center system and of modifying the device management store and the I/O port management store;

wherein

said storage management processor receives a demand for storage resources, the demand

specifying one of said storage devices, updates said device management store to manage the

status of one of the storage devices and said I/O port management store to manage the available

connections between the one storage device and the user machine, and sends a management

result responsive to said demand to the SoD center system;

updates to at least one of a plurality of paths connecting to storage resources allocated

from at least one of said plurality of storage devices are defined to an operating system of said

user machine; [[and]]

4

AMENDMENT UNDER 37 C.F.R. § 1.111
U.S. Application No.: 09/783,163

said SoD center system is remote from said plurality of storage devices and from said user machine; and

said resource management processor: receives an I/O command to access storage resources from said user machine; determines whether storage resources requested by said I/O command are usable by searching said device management store; performs said I/O command, if said storage resources requested by said I/O command are usable, otherwise rejects said I/O command; and sends an I/O result to said user machine.

7.   (*Previously Presented*) The apparatus of claim 6, said plurality of storage devices comprising at least one of magnetic disk, an optical disk, a magnetic-optical disk, and semiconductor memory.

8.   (*Original*) The apparatus of claim 6, further comprising a communications interface to a network, said storage management processor receiving said demand for storage resources over said network.

9.   (*Original*) The apparatus of claim 6, further comprising a fibre channel switch, said fibre channel switch providing capability to connect to at least one of a plurality of host computers.

10.   (*Currently Amended*) A method for configuring a host to access resources in a storage subsystem, said host, said storage subsystem, and a center system being remote from each other and interconnected by a communication network, said method comprising:

5

AMENDMENT UNDER 37 C.F.R. § 1.111
U.S. Application No.: 09/783,163

receiving at said host an I/O path setting request from said center system, said I/O path

setting request specifying a path to a storage resource in said storage subsystem allocated for use

by said host, said path defining a unique communication channel from one of a plurality of host

I/O controllers on said host to one of a plurality of I/O ports on said storage subsystem;

requesting an operating system resident in said host to update an I/O path setting in an

I/O path setting table based upon said I/O path setting request;

receiving an update result from said operating system; [[and]]

sending a setting result to said center system based upon said update result, thereby

enabling the center system to manage accessibility of the storage resource by the host; and

receiving at said storage subsystem an I/O command to access storage resources from

said host; determining whether storage resources requested by said I/O command are usable by

searching a device management table; performing said I/O command, if said storage resources

requested by said I/O command are usable, otherwise rejecting said I/O command; and sending

an I/O result to said host.

11.   (*Previously Presented*) The method of claim 10, wherein updating said I/O path

setting comprises: storing an indication that a particular I/O port in said storage subsystem is

accessible to a particular host I/O controller.

12.   (*Previously Presented*) The method of claim 10, further comprising:

receiving at said center system an input of a demand for storage resources;

determining whether sufficient resources exist to meet said demand;

6

AMENDMENT UNDER 37 C.F.R. § 1.111
U.S. Application No.: 09/783,163

sending said demand for storage resources to said storage subsystem, if sufficient

resources were determined to exist;

receiving from said storage subsystem a management result, said management result

indicating whether storage resources have been successfully allocated in accordance with said

demand;

storing said management result;

determining whether said demand includes an I/O path setting request;

sending said I/O path setting request to said host, if said demand included an I/O path

setting request;

receiving said setting result from said host; and

storing said setting result.

13.   (*Previously Presented*) The method of claim 12, further comprising:

receiving said demand for storage resources at said storage subsystem;

determining whether said demand includes a command to make at least one of a plurality

of installed devices available;

updating a device management store, if said demand includes a command to make at least

one of a plurality of installed devices available;

updating an I/O port management store; and

sending a resource management result to said center system.

7

AMENDMENT UNDER 37 C.F.R. § 1.111
U.S. Application No.: 09/783,163

14. *(Previously Presented)* The method of claim 13, wherein updating a device management store comprises: storing an indication that a particular device is usable.

15. *(Previously Presented)* The method of claim 13, wherein updating a I/O port management store comprises: storing an indication that a particular I/O port is usable.

16. *(Previously Presented)* The method of claim 13, further comprising:

receiving at said storage subsystem an I/O command to access storage resources from said host;

determining whether storage resources requested by said I/O command are usable;

performing said I/O command, if said storage resources requested by said I/O command are usable, otherwise rejecting said I/O command; and

sending an I/O result to said host.

17. *(Previously Presented)* The method of claim 16, wherein determining whether storage resources requested by said I/O command are usable comprises:

searching said device management store to determine whether devices requested in said I/O command are usable.

18. *(Previously Presented)* The method of claim 17, wherein determining whether storage resources requested by said I/O command are usable further comprises:

8

AMENDMENT UNDER 37 C.F.R. § 1.111
U.S. Application No.: 09/783,163

searching said I/O port management store to determine whether I/O ports requested in

said I/O command are usable and whether devices requested in said I/O command are accessible

via I/O ports requested in said I/O command.

19.   (*Currently Amended*) A computer program product for configuring a host to

access resources in a storage subsystem, said host, said storage subsystem, and a center system

being remote from each other and interconnected by a communication network, said computer

program product comprising:

code that receives at said host an I/O path setting request from said center system, said

I/O path setting request specifying a path to a storage resource in said storage subsystem

allocated for use by said host, said path defining a unique communication channel from one of a

plurality of host I/O controllers on said host to one of a plurality of I/O ports on said storage

subsystem;

code that requests an operating system resident in said host to update an I/O path setting

in an I/O path setting table based upon said I/O path setting request;

code that receives an update result from said operating system;

code that sends a setting result to said center system based upon said update result, the

codes thereby enabling the center system to manage accessibility of the storage resource by the

host; and

code that receives at said storage subsystem an I/O command to access storage resources

from said host; determines whether storage resources requested by said I/O command are usable

9

AMENDMENT UNDER 37 C.F.R. § 1.111
U.S. Application No.: 09/783,163

by searching a device management table; performs said I/O command, if said storage resources

requested by said I/O command are usable, otherwise rejects said I/O command; and sends an

I/O result to said host; and

    a computer readable storage medium for holding the codes.

    20.   *(Previously Presented)* The computer program product of claim 19, further

comprising:

    code that receives at said center system an input of a demand for storage resources;

    code that determines whether sufficient resources exist to meet said demand;

    code that sends said demand for storage resources to said storage subsystem, if sufficient

resources are determined to exist;

    code that receives from said storage subsystem a management result, said management

result indicating whether storage resources have been successfully allocated in accordance with

said demand;

    code that stores said management result;

    code that determines whether said demand includes an I/O path setting request;

    code that sends said I/O path setting request to said host, if said demand includes an I/O

path setting request;

    code that receives said setting result from said host; and

    code that stores said setting result.

    21-26.   *(Canceled)*

10